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EXAMINER	
HO, CHUONG T	

ART UNIT	PAPER NUMBER
2664	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/035,027	ZHUANG ET AL.	
	Examiner	Art Unit	
	CHUONG T. HO	2664	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-29* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *28 and 29* is/are allowed.

6)☒ Claim(s) *1-20 and 24-27* is/are rejected.

7)☒ Claim(s) *21-23* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *4,5*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

1. Claims 1-29 are pending.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 1, 12, 17, 19 are rejected under 35 U.S.C. 102(e) as being anticipated by Wu et al. (U.S.Patent No. 6,850,481 B2).

In the claim 1, Wu et al. discloses providing a datastream comprised of bits (see col. 4, lines 25-27, a stream of raw data bits is delivered to a encoder 102 which segments the stream into segment of 1024 bits); comprising:

- Interleaving (interleaver 103) the bits of the datastream across a plurality of orthogonal frequency division multiplexing radio frequency transmitters (STTD/SM OFDM Encoders 106, 116, 126) (see col. 4, lines 40-42, the encoders 106, 116, 126 assign the constellation points to respective sub-carrier channels.... The OFDM sub-carrier channels each have a frequency spectrum such that the frequency of the primary signal peak of the sub-carrier coincides with a minima in the spectra of neighboring sub-carrier channels so that the sub-carriers are orthogonal to each other),

wherein each of the radio frequency transmitters (106, 116, 126) transmits a plurality of radio frequency subcarriers to provide interleaved bits;

- Transmitting data that corresponds to the interleaved bits using the plurality of radio frequency subscarriers of the plurality of orthogonal frequency division multiplexed radio frequency transmitters (106, 116, 126) (see col. 4, lines 40-42, the encoders 106, 116, 126 assign the constellation points to respective sub-carrier channels.... The OFDM sub-carrier channels each have a frequency spectrum such that the frequency of the primary signal peak of the sub-carrier coincides with a minima in the spectra of neighboring sub-carrier channels so that the sub-carriers are orthogonal to each other);

3. In the claim 12, see figure 1, Wu et al. discloses an encoder (102) having a single datastream input and an encoded bits datastream output (see col. 4, lines 25-27); comprising:

- A multiple-input multiple-output modulator (m-PSK n-QAM Modulator 104) having an input operably coupled to the encoded bits datastream output of the encoder (encoder 102) and having a serial-to-parallel output that provides first (STTD/SM OFDM Encoder 106) and second (STTD/SM OFDM Encoder 116) items of modulation information that corresponding to the encoded bits (see col. 4, lines 40-42, the encoders 106, 116, 126 assign the constellation points to respective sub-carrier channels.... The OFDM sub-carrier channels each have a frequency spectrum such that the frequency of the primary signal

peak of the sub-carrier coincides with a minima in the spectra of neighboring sub-carrier channels so that the sub-carriers are orthogonal to each other);

- A first orthogonal frequency division multiplexed transmitter (106) having an input operably coupled to a first output of the serial-to-parallel output of the multiple-input multiple-output modulator (104) to receive the first items of modulation information (see col. 4, lines 37-40); and a multiple subscarrier radio frequency transmission output (see col. 4, lines 40-42, the encoders 106, 116, 126 assign the constellation points to respective sub-carrier channels.... The OFDM sub-carrier channels each have a frequency spectrum such that the frequency of the primary signal peak of the sub-carrier coincides with a minima in the spectra of neighboring sub-carrier channels so that the sub-carriers are orthogonal to each other);
- A second orthogonal frequency division multiplexed transmitter (116) having: an input operably coupled to a second output of the serial-to-parallel output of the multiple-input multiple-output modulator (104) to receive the second items of modulation information (see col. 4, lines 37-40); and a multiple subcarrier radio frequency transmission output (see col. 4, lines 40-42, the encoders 106, 116, 126 assign the constellation points to respective sub-carrier channels.... The OFDM sub-carrier channels each have a frequency spectrum such that the frequency of the primary signal peak of the sub-carrier coincides with a minima in the spectra of neighboring sub-carrier channels so that the sub-carriers are orthogonal to each other);

- Such that information comprising the encoded bits datastream (see col. 4, lines 25-27) are interleaved (103) across the multiple subcarriers of the first (106)and second (116) orthogonal frequency division multiplexed transmitters (see col. 4, lines 40-42, the encoders 106, 116, 126 assign the constellation points to respective sub-carrier channels.... The OFDM sub-carrier channels each have a frequency spectrum such that the frequency of the primary signal peak of the sub-carrier coincides with a minima in the spectra of neighboring sub-carrier channels so that the sub-carriers are orthogonal to each other).

4. In the claim 17, Wu et al. discloses providing a first (STTD/SM OFDM 106) and second (STTD/SM OFDM 116) orthogonal frequency division multiplexed transmitter wherein each transmitter transmits a plurality of subcarriers (see col. 4, lines 40-49) at frequencies that are substantially identical as between the first (106) and second (116); Providing a single stream of data comprised of sequential bits (see col. 4, lines 25-27); Interleaving (interleaver 103) the sequential bits across the plurality of subcarriers (see col. 4, lines 40-42, the encoders 106, 116, 126 assign the constellation points to respective sub-carrier channels.... The OFDM sub-carrier channels each have a frequency spectrum such that the frequency of the primary signal peak of the sub-carrier coincides with a minima in the spectra of neighboring sub-carrier channels so that the sub-carriers are orthogonal to each other) for both the first (106) and second (116) orthogonal frequency division multiplexed transmitters (see col. 4, lines 40-49).

5. In the claim 19, Wu et al. discloses using at least one orthogonal division multiplexed transmission receiver (see figure 2, col. 5, lines 36-37, lines 40-45) having

at least one antenna (202, 224, 244) to receive multi-antenna transmission signals across a plurality of subcarriers (see col. 5, lines 40-45);

Demodulating (214, 234, 254) the received multi-antenna transmission signals to provide bit metrics corresponding to a single bit stream (see col. 4, lines 25-27).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 2-11, 13-16, 18, 20, 24-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wu et al. (U.S.Patent No. 6,850,481 B1) in view of Sarraf et al. (U.S.Patent No. 6,747,948 B1).

In the claim 2, Wu et al. discloses the limitations of claim 1 above.

However, Wu et al. is silent to disclosing providing datastream comprised of bits includes providing a datastream comprised of bits as provided from a single source.

Sarraf et al. , see figure 2, discloses the signal generation unit modulates a plurality of subcarriers, which may be OFDM sub-carriers, based on the interleaved substream and upconverts the modulated subcarriers for transmission (see col. 2, lines 32-35); comprising:

- providing datastream comprised of bits includes providing a datastream comprised of bits as provided from a single source (see col. 2, lines 20-22, the encoder receives blocks of source data from one or more data sources).

Both Wu and Sarraf discloses an orthogonal frequency division multiplexing (OFDM). Wu recognizes providing datastream comprised of bits includes providing a datastream comprised of bits as provided from a single source. Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the system of Wu with the teaching of Sarraf to provide providing datastream comprised of bits includes providing a datastream comprised of bits as provided from a single source in order to improve the performance of error correction decoders.

7. In the claim 3, Sarraf et al. discloses provising a datastream comprised of bits includes providing a datastream comprised of bits as provided from a plurality of sources (see col. 2, lines 20-22, the encoder receives blocks of source data from one or more data sources).

8. In the claim 4, Sarraf et al. discloses providing a datastream comprised of bits as provided from a plurality of sources (see col. 2, lines 20-22, the encoder receives blocks of source data from one or more data sources) includes providing a datastream comprised of bits as provided from a plurality of sources (see col. 2, lines 20-22, the encoder receives blocks of source data from one or more data sources) wherein at least some of the bits as provided from at least one of the plurality of sources are encoded bits (encoding unit 16, see figure 2) (see col. 3, lines 27-55).

9. In the claim 5, Sarraf et al. discloses providing a datastream comprised of bits includes providing a datastream comprised of encoded bits (encoded data, see abstract) (see col. 3, lines 27-55).

10. In the claims 6, 13, 14, 15, Sarraf et al. discloses a datastream comprised of encoded bit includes providing a datastream comprised of convolutionally encoded bits (see col. 3, lines 27-55).

11. In the claim 7, Sarraf et al. discloses providing a datastream comprised of encoded bits includes providing a datastream comprised of serially concatenated convolutionally encoded bits (see col. 3, lines 27-55).

12. In the claim 8, Sarraf et al. discloses providing a datastream comprised of encoded bits includes providing a datastream comprised of parallel (see col. 3, line 21) concatenated convolutionally encoded bits (see col. 3, lines 27-55).

13. In the claim 9, See figure 1, Wu et al. discloses providing a datastream (see col.4, lines 25-27) comprising of encoded bits includes providing a datastream comprised of encoded bits (FEC Encoder 102) (see col. 4, lines 30-35); and interleaving (interleaver 103) the bits of the datastream across a plurality of orthogonal frequency division multiplexed radio frequency transmitters (106, 116, 126) includes interleaving the encoded bits of the datastream across the plurality of orthogonal frequency division multiplexed radio frequency transmitters (106, 116, 126) (see col. 4, lines 37-49).

14. In the claim 10, Sarraf et al. discloses interleaving the encoded bits of the datastream includes alternating assignment of consecutive encoded bits to the radio frequency transmitters and on a plurality of the subcarriers having channel responses with low correlation (see col. 3, lines 57-67, col. 4, lines 1-5).

15. In the claims 11, 16, Sarraf et al. discloses transmitting data that corresponds to the interleaved bits includes transmitting symbols wherein each symbol represents a plurality of the interleaved bits (see col. 3, lines 57-67).

16. In the claim 18, Wu et al. discloses interleaving (see figure 1, interleaver 103) the sequential the sequential bits across the plurality of subcarriers of both the first (106) and second (116) orthogonal frequency division multiplexed transmitters includes interleaving the sequential bits across the plurality of subcarriers (see col. 4, lines 37-49) for both the first (106) and second (116) orthogonal frequency division multiplexed transmitters such that consecutive encoded bits of each datastream will be transmitted from transmitters and subcarriers with substantially minimal correlation (see col. 6, lines 66-67).

17. In the claim 20, Sarraf et al. discloses de-interleaving the bit metrics of the single bit stream (see col. 6, line 35).

18. In the claim 24, Sarraf et al. discloses decoding (decoding unit 60) to recover at least one information source based on the de-interleaved bit metrics (58) (see col. 7, lines 15-30).

19. In the claim 25, Sarraf et al. discloses decoding includes serially concatenated convolutionally decoding the single stream of data (see col. 7, lines 15-30).

20. In the claim 26, Sarraf et al. discloses decoding includes parallel concatenated convolutionally decoding the single stream of data (see col. 7, lines 15-30).

21. In the claim 27, Sarraf et al. discloses decoding includes convolutionally decoding the single stream of data (see col. 7, lines 15-30).

Allowable Subject Matter

22. Claims 21-23 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

23. Claims 28-29 are allowed.

24. The following is an examiner's statement of reasons for allowance: the prior art (6747948, 6850481, 20030072254, 20020122381, 20030003880, 6771706, 20020191703) of record does not appear to teach or render obvious the claimed limitations in combination with the specific added limitations, as recited from independent claims 28: "wherein demodulation include the use of a zero forcing symbol metric estimator based on ('ln" stands for the natural logarithm) ln P (...) where S is the estimated symbol at the Kth subcarrier of the Jth transmitted antenna, i.e. [..] = w, yk with filter matrix Wk being the zero forcing matrix computed based on the channel matrix Hk and where Wk (:j) denoted the jth column of Wk "II.II" denotes the vector nome, O is the noise power, and S is any of the constellation symbols ".

25. The following is an examiner's statement of reasons for allowance: the prior art (6747948, 6850481, 20030072254, 20020122381, 20030003880, 6771706, 20020191703) of record does not appear to teach or render obvious the claimed limitations in combination with the specific added limitations, as recited from independent claims 28: "wherein demodulation include the use of a minimum mean squared error symbol metric estimate based on ("ln" stands for the natural logarithm....is the average symbol power, and S is any of the constellation symbols".

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Any inquiry concerning this communication or earlier communications from the examiner should be directed to CHUONG T. HO whose telephone number is (571) 272-3133. The examiner can normally be reached on 8:00 am to 4:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wellington Chin can be reached on (571) 272-3134. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

10/31/05

WELLINGTON CHIN
SUPERVISORY PATENT EXAMINER